ATTACHMENT A

Scope of Work
Water System Update and Master Plan Assistance

Background
The City of Kingsport (City) has requested an update to their existing WaterGEMS water system model in addition to condition assessment of approximately 14 water pump stations and assistance with compliance with the 2023 EPA Lead and Copper Rule Revisions (LCRR).

Summary of Work – Water System Model Update
The City of Kingsport manages a water system of approximately 40,000 customers and maintains a Bentley Systems WaterGEMS hydraulic model of the system. Hazen will utilize their current model, available GIS data, and operational data to update the model to best reflect the layout and operations of the current system. Use updated model to determine proper size of Edens View Tank. Prepare 20 year population projection to prepare for growth of system.

Summary of Work – Water Pump Station Condition Assessment
Hazen will visit all 14 of the water pump stations and provide an update to the current asset information for each and assess condition. Hazen will review capacity information, risk of failure, and identify major improvements required at each station. This information will be summarized in a technical memo with all field collected data, along with planning level budgets for improvements.

Summary of Work – LCRI Assistance
The City of Kingsport is currently working to fulfill the requirements of the LCRR including developing a Lead Service Line (LSL) Inventory that is due October 2024. Hazen will perform a desktop Corrosion Control Evaluation of the existing Water Treatment Plant and distribution system.

SCOPE OF SERVICES

Task 1.0 – Project Management
This scope of this task will include the general functions of maintaining a project on schedule and budget and delivering a project consistent to the standards of Hazen and the City of Kingsport.

A. Hazen will meet with the City to review the scope of project and collect existing data. Required data will include but is not limited to record drawings, survey, and any pertinent reports or documents. The Engineer will review the existing data and determine completeness to proceed with the project. After

review, Hazen will make request for any additional data or information necessary to complete the services associated with the project.

B. Hazen will hold a project kick off meeting with the key design leads and appropriate staff from the City. Project scope, schedule, budget, communication protocol and project roles and responsibilities will be discussed. For all meetings, Hazen will prepare a brief meeting summary, documenting key decisions and action items. Hazen will send a draft meeting summary to the project team for review. Comments will be incorporated, and final meeting summary sent to the team for the project record.

C. Hazen will develop a project schedule and maintain the schedule throughout the project. The ENGINEER will develop meeting agendas and meeting minutes for scheduled meetings.

Task 2.1 – Water Model Update Scope of Services

A. Update the current WaterGEMS model with latest water mains from City provided GIS.
B. Update pressure zones to reflect current conditions.
C. Add pressure reducing valves (PRV's), and other control valves, if missing from model.
D. Hazen will update pump curves and controls for pumps and valves as needed with information provided from City staff and its SCADA system. Hazen will also work with staff to add any new developments within the original model since the last update.
E. Update demand in model from water billing records.
F. Hazen will compare the steady state model results to selected field test results at locations identified by Hazen and performed by City staff including pressure checks and fire flow tests. SCADA will be used to obtain tank levels and operation status of system pumps during the specific dates and times of field tests. If additional field testing is required to validate the model, Hazen will administer tests with the City's approval. This level of effort is estimated to include up to one week of on-site testing by Hazen staff.
G. In addition to the steady-state simulations, extended period runs will be conducted to simulate current operational controls and to compare model results against observed measurements from SCADA including flow supplied by pump stations and levels at storage tanks.
H. Update location of critical isolation valves. Information to be provided by City through Hydromax USA as it is available.
I. Provide updated diagram of water system pressure zones from previous master plan.
J. During the update of the water model, Hazen will evaluate the existing Edens View tank. This will include a desktop analysis of current demand for the tank's service area and tank turnover from historical SCADA tank level data. The evaluation will determine proper size of tank.

K. Prepare 20 year population projection to prepare for growth of system. To be based on available census data and provided zoning and land use plans. The City to assist with defining anticipated water system limits.

Upon completion of model updates and calibration, Hazen will prepare a technical memorandum to summarize the work performed and comparison of model results to field observed values for both steady state and extended period simulations.

DATA OR ASSISTANCE TO BE PROVIDED BY THE CITY

1. Provide a copy of the existing WaterGEMS model.
2. Provide a copy of their current GIS system including mains, valves, pump stations, ARV's, tanks.
3. Provide water system update plans for extensions or developments that are not currently included in the model.
4. Provide copies of existing record drawings for water, wastewater and storm water facilities to be impacted in the project area.
5. For the demand update, Hazen will require a point shapefile created by the City of all its water meters and with monthly consumption data from its billing records for the previous 12 months. This data will be used to allocate actual demand in the model. Different usage types (e.g. residential, commercial, wholesale, industrial, irrigation, etc.) will need to be part of the information in the shapefile so that Hazen can properly allocate demand and assign an appropriate diurnal pattern for extended period simulations. City will provide data from large user accounts to create separate diurnal patterns as necessary.
6. Provide AMI meter data as available for review of system demand if available.
7. Zoning and land use planning documents for population projections.
8. Timely reviews of submittals from the Consultant.

Task 2.2 – Water Pump Station Condition Assessment Scope of Services

A. Hazen will visit each of the identified 14 water pump stations with the goal of creating a condition assessment of each. Current condition will be documented and recorded for evaluation.

B. A minimum of one senior/experience process/mechanical lead and one electrical lead will visit each station. The team will perform visual and technical inspection of all assets, expected to be performed with the data collection task.

C. Hazen will update the City's current asset inventory for each station and note any changes or deviations from current documentation and review current operation and maintenance procedures.

D. Based on the site visits, Hazen will provide overall risk assessment scores to develop hierarchy of risk potential for ranking assets in order of rehabilitation or replacement urgency.
E. Provide planning level budgets for repairs at each pump station.

Upon completion of site visits and data collection, Hazen will prepare a technical memorandum to summarize the findings at each pump station. Each pump station will have an updated asset inventory along with photo documentation and brief summary of potential upgrade projects. A risk score will also be assigned to each pump station.

DATA OR ASSISTANCE TO BE PROVIDED BY THE CITY

1. Provide copies of existing record drawings for each pump station.
2. Provide records of historical maintenance and upgrades for each station.
3. Provide pump manufacture and curve information for each.
4. Provide existing asset information for each pump station.
5. Provide available GIS files for the pump stations.

Task 2.3 – Desktop Corrosion Control Evaluation Scope of Services

The Scope of Work in this Task is to perform a proactive desktop corrosion control evaluation for the City's water system**.** Hazen will complete the following tasks:

- Task 2.3.1: Kickoff Meeting
- Task 2.3.2: Historical Water Quality Analyses
- Task 2.3.3: Lead and Copper Evaluation
- Task 2.3.4: Water Corrosivity Modeling
- Task 2.3.5 – Optimal Corrosion Control Treatment Recommendation
- Task 2.3.6: Corrosion Control Treatment Recommendation - Technical Memorandum
- Task 2.3.7: Corrosion Inhibitor Workshop

Through years of practical experience, Hazen has developed a comprehensive approach for evaluating corrosion control treatment for optimization and LCR compliance as shown in the figure below. Our approach is consistent with the latest Environmental Protection Agency (EPA) guidelines and industry best practices for corrosion control (Figure 1).

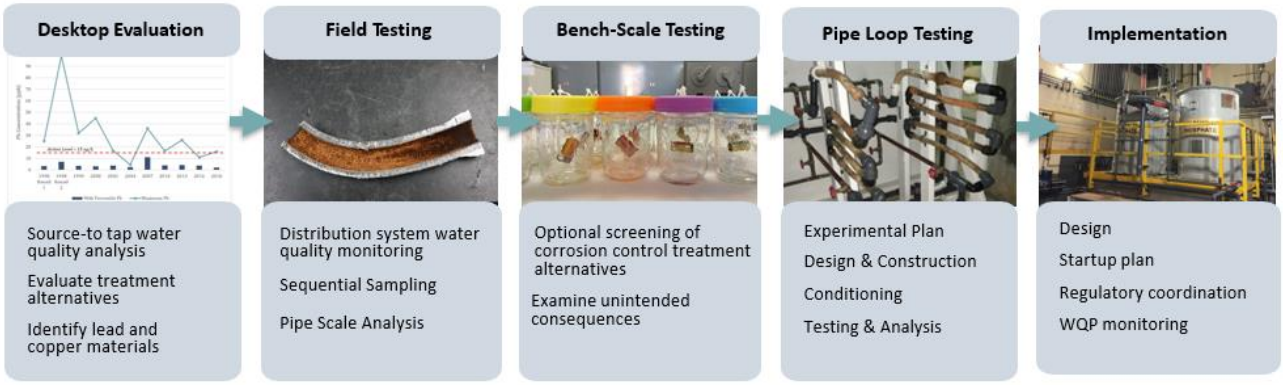

Figure 1. Overview of Technical Approach for Corrosion Control Evaluation

Desktop Corrosion Control Study Scope of Services:

Task 2.3.1 –Kickoff Meeting

Hazen will conduct a kickoff meeting to introduce the various team members and review the project scope and required deliverables. This meeting will also provide an opportunity for Hazen to work with City's staff to gather institutional knowledge on historical treatment and operation conditions. A data request will be provided, and any information received on plant operating and water quality data will be reviewed by Hazen prior to the meeting, as well as any available information regarding corrosion control efforts, lead and copper levels, and related sampling. Hazen will prepare an agenda for the kickoff meeting and will provide meeting minutes to distribute to attendees.

Task 2.3.1 Deliverables:

- Data Request
- Kickoff Workshop Agenda
- Kickoff Workshop Meeting Minutes

Task 2.3.2 – Historical Water Quality Analyses

Creating a holistic understanding of baseline water quality is the first step in evaluating corrosion. Systems must balance water quality objectives and achieve simultaneous compliance with multiple regulations affecting the distribution system. In the initial assessment, Hazen will work with the City's water treatment, operations, and transmission system staff to gather information and provide a fresh look at finished water quality. Baseline data on critical factors affecting lead and copper release will be requested, such as pH, alkalinity, chloride, sulfate, aluminum, conductivity, and free chlorine. It is assumed that available data will be provided by the City in a compiled and readily useable digital format, such as excel. We will also evaluate available historical water treatment

plant data, including finished water quality parameters. Hazen will analyze available distribution system water quality data to evaluate changes in water quality within the distribution system that could influence lead and copper corrosion. We will provide a detailed list of water quality parameters needed for the corrosion evaluation and work with City staff to ensure that all necessary data is provided.

Task 2.3.2 Deliverables:

- Summary Water Quality Analysis Table
- Historical Water Quality Analysis Charts

Task 2.3.3 – Lead and Copper Evaluation

Identifying sources of lead is a critical aspect of evaluating lead corrosion. Hazen will leverage existing knowledge of distribution materials and service lines through the City's Service Line Inventory. We will also collaborate with City staff to understand all potential sources of lead within City's service area, such as lead service lines, leaded solder, galvanized service lines, lead goosenecks, and leaded brass. This information is used to interpret historical lead concentrations and assist in decision-making for corrosion control.

To understand the potential for lead and copper corrosion in the system, Hazen will analyze historical lead and copper concentrations. While the LCR focuses on the 90th percentile lead and copper concentrations for compliance purposes, Hazen will analyze the full range of lead and copper levels and evaluate geospatial patterns of lead and copper concentrations in the distribution system. While a complete history of LCR compliance sampling data is preferred (back to the initial LCR compliance sampling in 1991), a minimum of 15 years of LCR data is requested.

Task 2.3.3 Deliverables:

- Lead and Copper Evaluation Graphs
- Map of Historical Lead and Copper Sampling Sites in Relation to Current Inventory Status

Task 2.3.4 – Water Corrosivity Modeling

Using the water quality and operating data obtained, Hazen will run desktop models to identify the corrosivity of the finished drinking water from the Kingsport water treatment plant on the South Fork of the Holston River. Analyses that will be run include the Rothberg Tamburini & Winsor model for calcium carbonate precipitation potential and

overall water corrosivity, and the chloride to sulfate mass ratio for galvanic corrosion. While research has shown that many water quality indices such as Langelier Saturation Index do not directly correspond to lead corrosion, Hazen will compute these indices to supplement our overall understanding of distribution system water quality and relative corrosivity of the Holston River water sources.

Task 2.3.4 Deliverables:

- Updated Table of Water Corrosivity Model Results.

Task 2.3.5 –Corrosion Control Treatment Recommendation

The critical interplay of corrosion control treatment, plant operations, and distribution system operations needs to be considered when optimizing treatment processes. This interaction necessitates a unique approach for optimizing corrosion control in each system. The results of the water quality analysis completed in Task 3 will be used to identify opportunities to improve corrosion control in accordance with 2016 EPA corrosion control guidance and the latest industry research. In developing corrosion control recommendations, Hazen will evaluate potential unintended consequences and secondary impacts of treatment changes. If a change in corrosion control strategy is recommended, Hazen will provide a plan for pilot testing and implementation.

Task 2.3.5 Deliverables:

- Summary of recommended treatment and/or operational changes to optimize corrosion control.

Task 2.3.6 – Final Technical Memorandum

Recommendations for optimal corrosion control will be presented in a final Technical Memorandum. A draft version will be submitted for review. A final presentation will be made to the City after comments are received and incorporated in a final version.

Task 2.3.6 Deliverables:

- Draft Optimal Corrosion Control Technical Memorandum
- Final Optimal Corrosion Control Technical Memorandum

Task 2.3.7 – Corrosion Control and Inhibitor Workshop

Hazen will facilitate a workshop with City to discuss the use of corrosion control inhibitors to optimize corrosion control. This workshop will include an overview of current corrosion control strategies being implemented in the City's systems and training materials to understand the proper use of pH/Alkalinity and inhibitor products to optimize corrosion control. Hazen corrosion control experts will evaluate current corrosion control practices being implemented within City systems and provide considerations for how current practices can be improved. The workshop will provide an opportunity for Hazen to answer any questions the City may have on current practices and research being completed on corrosion control processes.

Task 2.3.7 Deliverables:

- Workshop Agenda
- Corrosion Control and Inhibitor Training Presentation

DATA OR ASSISTANCE AND ASSUMPTIONS

1. All data will be provided in digital, electronic format. Manual transcription of data from hard copies of information will require additional effort and fees and will extend the project schedule.
2. No design, permitting or laboratory services are included.

TIME OF COMPLETION

Task 2.1 – Water Model Update: The updated water model shall be complete within four (4) months of delivery of all the required data. The final technical memorandum and results of the Edens Tank analysis shall be provided one (1) month after the delivery of the water model.

Task 2.2 - Water Pump Station Condition Assessment: The pump station condition assessment and final technical memorandum shall be complete within five (5) months of delivery of all the required data.

Task 2.3 – Corrosion Control Evaluation: The Corrosion Contral Analyss and final technical memorandum shall be complete within three (3) months of delivery of all the required data.

PAYMENT AND COMPENSATION

Invoicing for the work shall be monthly based on a percentage of work accomplished. A status report will accompany each progress billing.

Below is the fee breakdown by task item.

Tasks 1 – Water System Assistance			
1.1	Project Management	Lump Sum	**$21,000**
2.1	Water Model Update	Lump Sum	**$108,000**
2.2	Water Pump Station Condition Assessment	Lump Sum	**$75,000**
2.3	Desktop Corrosion Control Evaluation	Lump Sum	**$63,000**
	Expenses (Field Work)	Lump Sum	**$9,000**
TOTAL – (No to Exceed)			**$276,000**

2.0 BIDDING SERVICES	NOT INCLUDED
3.0 CONSTUCTION ADMINISTRATION SERVCIES	NOT INCLUDED
4.0 RESIDENT INSPECTION SERVICES	NOT INCLUDED